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ABSTRACT

This discussion uses the topics imagery and elaboration as vehicles for speculating about the psychological character of knowledge, about its relationships with learning and development, and about its implications for education. In brief, the argument presented suggests that elaboration facilitates learning, that such facilitation signifies an important characteristic of human knowledge, that the character of knowledge is more episodic than hierarchical, that learning is the mental construction of episodes, that development liberates learning from its environmental dependence, and that neglect of these propositions in instructional planning may be detrimental to students' learning. Implications of this theory for educational practice advocate the use of references to students' previous experience and environmental prompts, and suggest that the ordering of information or the evaluation of learning in the classroom according to a hierarchical model may be misleading. (KS)

Imagery Constructs vs. Elaboration Constructs[1]

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Imagery Constructs vs. Elaboration Constructs

Although the idea of contrasting imagery with elaboration intrigues me, and the novel prospect of actually fulfilling the promise of a paper title arouses my sense of virtue, I've decided to deny myself these tempting pleasures. Instead, I have a different goal in mind. I want to use the topic of imagery and elaboration as an occasion for speculating about the psychological character of knowledge, about its relationships with learning and development, and about its implications for education.

This goal can be approached without making a comparative analysis of the notions of imagery and elaboration. Indeed, I will purposely gloss over possible differences between the two by considering imagery only in connection with performance on learning tasks, and construing elaboration so that it includes imagery as one of its manifestations. More specifically, the term elaboration will be used to refer to mental operations which construct an event or series of events that incorporate otherwise disparate entities and actions. The term imagery relates to this conception only in particularistic ways. For example, an investigator might seek to activate elaborative operations in other persons by instructing them to generate images of events, or, alternatively, these persons might report experiencing imagery in the course of working on some experimental task. In the present discussion, then, imagery will be used in a very restricted sense, even though Kosslyn (Kosslyn and Pomerantz, 1977), Levin (1976),

and Paivio (1971), among others, have taught us that its range of importance may extend far beyond this limitation.

The argument to be presented has several parts. In brief, they are: that elaboration markedly facilitates learning; that such facilitation signifies an important characteristic of human knowledge; that the character of knowledge is more episodic than hierarchical; that learning is the mental construction of episodes; that development increasingly liberates learning from its dependence on environmental support; and that neglect of these propositions in instructional planning may imperil the education of students. As this argument is presented, two things will become apparent. One is that its formulation here offers only the barest sketch of what would be required to make a persuasive case. The other is that most of the propositions which compose the sketch have been directly borrowed or adapted from the much more systematic work and thought of others. Thus, I want to acknowledge my general state of indebtedness in advance.

Elaborative Facilitation

The results of a number of studies can be interpreted as support for the proposition that elaboration facilitates learning and memory. (For reviews, see Levin, 1976; Paivio, 1971; Rohwer, 1973; Treiber and Groeben, 1976.) Typically, subjects have been given the task of memorizing a list of unrelated items, arranged in groups of two or more, and the core manipulation has been a comparison of performance in a standard condition with that in a treatment condition. In the standard condition, subjects are simply asked to study the items for a later test, while the treatment condition includes the addition of a prompt intended to increase the proba-

bility of elaboration. The prompt might be an instruction to generate a story or an image of an interaction involving the entities in each group, or the presentation of stories or pictures that portray such interactions, or an actual performance of interactions by either the learner or by the experimenter.

The amount of facilitation that results from such treatment conditions can range as high as several hundred percent, depending on a number of subject and task characteristics. It appears, for example, that facilitation is more likely among learners in the six to fourteen age range than among persons younger or older than these limits, and that more benefit accrues when the pace of study presentation is slow rather than fast. Even when facilitation fails, as sometimes happens with very young children, the difficulty can often be traced to inadequate prompting, as a study reported by Wolff and Levin (1972) illustrates. Whereas imagery instructions were inadequate to boost performance in a sample of five-year olds, the additional prompt of creating interactions manually resulted in substantial facilitation. In general, then, the available evidence is consistent with the generalization that elaborative treatment conditions are beneficial.

Nevertheless, there is an important exception to this rule. Many persons, especially after the onset of adolescence, perform quite proficiently in standard as well as in treatment conditions (Rohwer, Raines, Eoff, and Wagner, 1977). Even this exception, however, need not diminish the credibility of the proposition that elaboration facilitates performance, since the relevant operations can be presumed to be self-activated in proficient learners. This line of reasoning is saved from circularity by research like that of Pressley and Levin (1977), who have obtained evidence

of a relationship between subject reports of elaboration and task performance levels in standard conditions. It seems warranted, therefore, to adopt, at least provisionally, the proposition that elaboration facilitates performance on learning tasks.

What Does Facilitation Signify?

The next proposition to be examined is that elaboration reflects the way human beings customarily organize a large share of their knowledge. The key terms in the proposition are customarily and large share. Evidence alluded to in the preceding section suggests that many adolescents and adults ordinarily organize some information by means of elaboration, that is, information like that contained in lists of unrelated items. The evidence also indicates that younger persons can organize this kind of information in an elaborative fashion, when prompted to do so. Nevertheless, an important question remains unanswered: is an elaborative form of organization typical, not only of the rather stylized kinds of information presented in laboratory experiments, but of stored knowledge more generally?

There are at least two major alternatives to an elaborative conception of organization. One alternative, of course, is an associative model, as discussed, for example, by Postman (1972). The other alternative model is manifest in the work of Collins and Quillian (1972) on sets and supersets as well as in the approach stated by Mandler (1967, p. 328) as a general principle: ". . . the organization of, and hence memory for, verbal material is hierarchical, with words organized in successively higher-order categories." This alternative, which will be referred to as the hierarchical position, contrasts sharply with an elaborative conception.

Highlights of the contrast are revealed in Schank's (1975, pp. 255-56)

discussion of long-term memory.

> ". . . Tulving (1972) proposed that this memory (semantic memory) ought to be divided into two distinct pieces: a hierarchical portion containing static knowledge about relations between 'words, concepts, and classification of concepts'; and an episodic portion which contains information gained through personal experience.
>
> What we shall argue . . . is that the distinction between semantic memory and episodic memory is a false one. We shall argue that what must be present is a lexical memory which contains all of the information about words, idioms, common expressions, etc., and which links these to nodes in a conceptual memory which is language free. We believe that it is semantic memory rather than episodic which is the misleading notion. Once we change semantic memory by separating out lexical memory, we are left with a set of associations and other relations between concepts that could only have been acquired by personal experience. We claim that conceptual memory, therefore, is episodic in nature."

As can be seen, Schank's conception of episodic conceptual memory matches closely with what I have referred to as elaborative organization, and I also share most of his contentions about this form of information storage.

However plausible these proposals might be, their credibility would be increased by supportive empirical evidence. Are there data relevant to a decision between the competing models? Schank (1975) himself cites corroborative evidence, but it is largely anecdotal in character. Current work

by proponents of a constructive approach to comprehension (e.g., Bransford and McCarrell, 1974) can be interpreted as support for an elaborative conception, especially in demonstrations that previously elaborated mental episodes are critical for understanding prose passages. Yet such data by no means rule out competing hierarchical conceptions, and thus the present state of evidence hardly compels one to adopt an elaborative view.

In contrast, proponents of the hierarchical view can marshall considerable support by drawing on research in the list-learning arena itself. In this domain, the method of free recall has been the task most often used, and the key manipulation has been that of comparing different study-list structures in terms of their effects on numbers of items recalled and on amount of clustering in recall (Cofer, 1965). General trends in the results of such studies may be taken as support for a hierarchical view. For example, lists composed of items from taxonomic categories are learned more readily and exhibit more clustering in recall than lists of unrelated words. The amount recalled from a categorized list and the amount of clustering increase as a function of the prominence of its category structure and with increasing coherence of category members. In an even closer empirical approximation to the hierarchical view, Bower, Clark, Lesgold and Winzenz (1969) used a free recall list constituted of words drawn from successive levels of an a priori, hierarchical tree structure. The list was administered to college students in either of two ways, one that emphasized the structure and one that did not, and performance was markedly higher when the tree structure was made prominent. These and other results have been used to support the proposition that, customarily, information is mentally organized in a hierarchical form.

But outcomes of the kinds cited can also be used to argue against the hierarchical proposition. If learners typically possess information organized in a fashion reflected by categorized lists, they should require little, if any, prompting to exploit the structure of the materials in order to enhance their performance. Yet the available evidence apparently runs counter to this supposition. Even college students, who should surely be more likely than any other class of learners to possess hierarchically organized information, seem slow to take advantage of presumably congruent list structures, unless the hierarchical or categorical properties of a list are made salient. The facilitation that undoubtedly emerges when list structures are prominent may therefore signify that hierarchical organization is more alien than indigenous to the mental organization of information. Thus, the indecisiveness of the available empirical evidence allows room for speculation about an alternative to the hierarchical view, that is, an elaborative conception of human knowledge.

Elaborative Organization and Learning

In an elaborative conception, learning is seen as the mental construction of events, or event sequences (episodes), that serve to relate the otherwise isolated entities and actions that comprise them. Such events invariably have personal reference, whether it is implicit or explicit. For example, personal reference would be explicit in an episode that might be called "When I learned to ride my bicycle." The episode consists of me, my father, the maroon Hawthorne bicycle, the first joyful sensation of balance without support, and the three-foot high steel post in the middle of the school yard with which I collided head-on only moments after this initial ecstasy. Implicit personal reference is exemplified in the learning of principles such as those associated with levers and fulcra,

where one is either oneself perched at some point on the seesaw, straining to lift another person situated elsewhere, or, at a minimum, an observer of two other persons so engaged. Note that this notion denies the possibility of direct acquisition of abstractions, and is therefore akin to Davidson's (1976) concept of hypostatization; in short, personal reference is omnipresent in learning.

Although the terms just used to characterize an elaborative view of learning may at first seem distinctive, a moment's thought reveals their congruence with more familiar descriptions. Encoding, for example, can point to the way experiences are transformed into mental events. Alternatively, these events and episodes can be referred to as schemes, constructed from the interaction of organism and environment. The only terms essential to the elaborative notion are those concerning the character of what is learned, events, and the personal reference that is involved.

From an elaborative perspective, learning can occur in either of two broad classes of circumstances. Mental events can be constructed as a consequence of direct physical participation in, or observation of actual interactions of, entities in the environment, as in an episode like "going to school." Alternatively, the "stuff" of event construction can be entirely mental, when previously acquired entities are newly related by means of incorporation with actions previously related only with other entities. An example can be drawn from the empirical starting point of the present paper: persons attempting to memorize a noun pair have little difficulty in using previously stored mental events to construct a new one like "The CHAIN was coiled up in the BOWL." In addition to the distinction

itself, it should be noted that the first variety of learning is prerequisite to the second, that is, mental learning depends on prior learning through interaction. Though obvious, this distinction and its corollary between mental learning and learning through interaction has potentially important consequences, to be mentioned shortly, for questions of individual and developmental differences, as well as for education.

Although it is obligatory for any model of mental organization to give an account of phenomena like discrimination, generalization, and transfer, I will not attempt to offer one here. Instead, I will only note in passing that such accounts would probably refer to the elaboration of increasingly refined and inclusive mental episodes. These kinds of mental progress imply, for example, that one need never have attended an AERA vice-presidential address to anticipate the range of attire, grooming, and behavior that would be acceptable, provided one has previously constructed an appropriate convention-going episode.

Elaborative Organization and Development

Rather than attempting to formulate a peculiarly elaborative theory of human development, it is preferable merely to say that it would likely be largely consistent, if not entirely redundant, with Piagetian or Neo-Piagetian views (cf. Ammon, 1977; Case, 1977; Pascual-Leone, 1973). The seeds of this consensus are present in the elaborative view of the action-based origins of learning, and in the distinction between the two major classes of learning circumstances. Yet, despite the large degree of anticipated overlap with existing developmental theory, two aspects of an elaborative view deserve special emphasis.

The first point is that the content of mental development consists of

progressively more useful episodes, that is, episodes of wider and more precise applicability. Development, then, does not consist of the construction of ever more abstract and inclusive hierarchies. The second point concerns process. In terms of process, development consists of an increasing tendency to elaborate mental events and episodes in the absence of environmental support for doing so. In the course of development, there is a change in the balance between elaboration through interaction and purely mental elaboration, in that the early dominance of the interactive form gives way more and more to the mental form. In the particular case, however, this general trend is often overridden by the principle that learning through mental elaboration presupposes prior interactive learning, so that, when a person, even if he or she is an adult, embarks on activity in a personally novel domain, interactive elaboration will initially predominate over mental.

Although these points may have theoretical and research implications, they will be neglected in favor of exploring some potential implications for education. Still, the educational value of an elaborative view stems from these same points: that events or episodes are at the core of mental organization; that learning is the elaborative construction of such episodes; that intellectual development consists of increasingly independent elaborative activity; and that intellectual achievement depends on the character of the episodes constructed.

Elaborative Organization and Education

Much of what an elaborative view implies for education may be so evident by now that little more is needed than a list, one composed largely of items suggested by others many times before. An adoption of the

propositions advanced in the preceding sections suggests, for example, that:

--Instruction in any new topic should always begin with reference to episodes already in the student's possession, and must therefore be preceded by appropriate assessment of the student's episodic repertory.

--At the beginning of any new topic, and for young students generally, it is essential to provide strong environmental prompts for elaboration, usually through circumstances that foster interactive learning; it is more important, for example, that the introductory course, rather than the advanced course, should center on laboratory activities.

--It is more often than not a mistake, made under the banner of instructional necessity, to transform a subject or discipline into a hierarchical scheme and to present it to students in this form. Such transformations not only distort the subject matter, they are alien to the recipient's mental life.

--Similarly, it is deluding, and possibly even harmful, to evaluate instruction and student progress with tests composed of items that are stripped of episodic reference and derived instead from an implicit hierarchical model.

Thus, with the possible exception of the final item, a list of educational implications drawn from an elaborative model largely repeats suggestions often made before. The final item, however, may deserve expansion. Is it delusory to equate abstraction with intellectual attainment? And, if so, are significant numbers of persons so deluded?

Happily, I can use the task of commenting on these questions as an

opportunity to ring the topic of imagery back into the discussion. Happily, for imagery and elaboration share a feature than endears them both to me: they each call attention to the tangible, and its importance in cognition. Thus, my predictable answer to the first question is yes, abstract thought, as I understand the customary use of the phrase, is a misguiding goal for education because thought, in even its most exalted forms, is privately rooted in events and episodes, however mental they may be.

As for the second question, whether many people are so deluded, I suppose a proper answer would require, at a minimum, the results of an impeccably designed piece of survey research. Meanwhile, my guess is that this answer, too, should be yes. At least it seems so when I review the ways that many of my colleagues and I teach our courses, or the textbooks, workbooks, assignments, and tests my children carry home from school. These impressions, of course, all concern teacher views of the importance of apparently abstract thought. What of student views? Have we succeeded in deluding them as well as ourselves?

Although I know the tactic is inadequate, I will call only a single witness in support of my case. The witness is Joan Didion, a writer of considerable acclaim, who also happens to be a Berkeley graduate. Didion's views are testimony in only an incidental way, being excerpted from her article entitled "Why I Write." In introducing the article, she describes her qualifications to comment on writing with a personal declaration of her limits:

> ". . . I am not a scholar. I am not in the least an intellectual, which is not to say that when I hear the word

> 'intellectual' I reach for my gun, but only to say that I do not think in abstracts. During the years when I was an undergraduate at Berkeley I tried, with a kind of hopeless, late-adolescent energy, to buy some temporary visa into the world of ideas, to forge for myself a mind that could deal with the abstract.
>
> In short, I tried to think. I failed. My attention veered inexorably back to the specific, to the tangible, to what was generally considered, by everyone I knew then and for that matter have known since, the peripheral. . . . During those years I was traveling on what I knew to be a very shaky passport, forged papers: I knew that I was no legitimate resident in any world of ideas. I knew I couldn't think. . . . Had my credentials been in order I would never have become a writer. Had I been blessed with even limited access to my own mind there would have been no reason to write. I write entirely to find out what I'm thinking, what I'm looking at, what I see and what it means. . . . [To find out] What is going on in these pictures in my mind?" (Didion, 1977, p. 3).

Now, for all I know, Joan Didion, my chief witness, is in fine fettle, with no need whatever of my concern. But I am distressed by the idea that her personal kind of cognition fails to qualify even as "thought," much less as "intellectual." I'm even more distressed by the possibility that this view is widely held, by students and former students alike. And I'm particularly worried that the face we put on education convinces our

children that the view is valid, and that most of them therefore will never measure up. Thus I want, perhaps too much so, to extol the potential implications of an elaborative, or an episodic, or, if you prefer, an imaginal view of the character of human knowledge.

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